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European Union' s Natura 2000 Protected Area Network: Experiences and Implications (Post-print)

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Abstract

The EU Natura 2000 network of protected areas covers nearly 19% of the EU' s land territory and 10% of its marine areas, playing a significant role in biodiversity conservation and enhancing regional socioeconomic well-being, and is acclaimed as the world' s most successful transnational protected area network. Its successful experiences are mainly reflected in five aspects: (1) Through regional biodiversity conservation legislation, promoting member states to fulfill their legal obligations and advance the construction of the protected area network; (2) Based on the EU decision-making process, establishing a decision-making and implementation mechanism with multi-stakeholder participation throughout the entire process, enhancing the scientific rigor of decisions and the enthusiasm of multi-party participation; (3) Promoting strategic planning based on a holistic perspective, improving the connectivity of the protected area network and the rationality of spatial layout; (4) Coordinating regional development objectives, developing diversified funding channels, and using a funding application and evaluation system to promote the scientific formulation and effective implementation of protected area management plans; (5) Standardizing the recording of protected area data and making it openly shared, facilitating scientific research and management model innovation. These experiences hold important reference significance for the selection of pathways and models for global biodiversity cooperative governance, for China to lead and promote the formulation of strategies and policies for global biodiversity governance, and for the construction and optimization of China' s protected area system with national parks as the mainstay.

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Experience and Enlightenment of EU Natura 2000 Protected Area Network

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Abstract

The EU Natura 2000 protected area network, covering nearly 19% of the land and 10% of the sea in the EU, has played an important role in protecting biodiversity and enhancing regional socio-economic well-being, and is regarded as the most successful transnational protected area network in the world. Its successful experience is mainly reflected in five aspects: (1) promoting member states' compliance with the law and driving protected area network construction through regional biodiversity conservation legislation; (2) establishing a decision-making and implementation mechanism with whole-process participation of multiple stakeholders based on the EU resolution process, which enhances the scientific nature of decision-making and the enthusiasm of multi-party participation; (3) promoting strategic planning from a holistic perspective to improve the connectivity and spatial layout rationality of the protected area network; (4) coordinating regional development goals, developing diversified funding channels, and promoting scientific formulation and effective implementation of protected area management plans through a funding application and assessment system; and (5) standardizing the recording of protected area data and making it publicly available to support scientific research and management model innovation. These experiences have important implications for selecting paths and models for global biodiversity cooperative governance, for China to lead and promote the formulation of global biodiversity governance strategies and policies, and for the construction and optimization of China's protected area system with national parks as the mainstay.

Keywords: EU Natura 2000 protected area network, biodiversity conservation, protected areas, regional governance

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The world is facing a severe threat of accelerating biodiversity loss, and strengthening biodiversity conservation to maintain the material foundation for human survival has become a global consensus [1,2]. Establishing a protected area system is the most important way to protect biodiversity [3,4] and is receiving increasing attention from countries worldwide. The second phase of the 15th Conference of the Parties (COP15) to the UN Convention on Biological Diversity adopted the Kunming-Montreal Global Biodiversity Framework (hereinafter referred to as the “Kunming-Montreal Framework”), which proposes the action target of effectively protecting at least 30% of land, inland water, coastal and marine areas by 2030 (hereinafter referred to as the “30×30target”). *The proposal of the “30×30target” reflects the urgent desire to reverse the trend of global biodiversity loss.* target,” China, as the COP15 presidency and a responsible major country, needs to focus on improving global protected area coverage and governance effectiveness as a key lever to play a leading and exemplary role in global biodiversity governance.

The EU Natura 2000 protected area network (hereinafter referred to as “Natura 2000”), constructed and managed by the European Union, is acclaimed as the world’ s most successful transnational protected area network and has played an important role in protecting biodiversity and enhancing regional socio-economic well-being [5-7]. This paper analyzes the construction and governance experience of EU Natura 2000, aiming to provide reference for China to promote global biodiversity governance and build a protected area system with national parks as the mainstay.

1.1 Basic Situation

All 27 EU member states participate in Natura 2000. As of October 2022, Natura 2000 has established 18,651 protected sites, including 15,576 terrestrial sites and 3,075 marine and other water area sites, covering nearly 19% of the EU’ s land and nearly 10% of its seas. The coverage rate of Natura 2000 protected areas in most countries ranges between 10%-20%. Eastern European countries such as Slovenia have relatively high coverage rates exceeding 30%, while Western European countries like France, affected by long-term industrial development, face more challenges in expanding protected areas and have relatively lower coverage rates (Table 1).

On the basis of gradually increasing protected area coverage and basically achieving the “Aichi Target,” Natura 2000’ s current main goals are to expand marine

protected areas within its domain and to incorporate adjacent non-EU protected areas under unified management to promote the realization of the “30×30 target.” Meanwhile, Natura 2000 also faces issues such as inadequate funding supervision mechanisms and uneven protection effectiveness among different countries.

1.2 Natura 2000 Plays an Important Role in Promoting EU Sustainable Development

Numerous monitoring, evaluation, and research studies have demonstrated that Natura 2000 delivers important ecological, health, economic, and social benefits, playing a significant role in promoting EU sustainable development.

(1) Ecological benefits. Natura 2000 has significantly improved ecological quality in the EU. The European ecological status assessment [8] shows that habitat and endangered species conservation across Europe improved by 6% in both the 2007–2012 and 2013–2018 evaluation periods. Between 2014–2020, EU member states increased forest area by 13% and wetland area by 10%, with the number of protected endangered flora and fauna species increasing to 2,300, double the number at the beginning of Natura 2000’s operation in 2000.

(2) Health and well-being benefits. Natura 2000 has positively impacted local residents’ physical and mental health. For example, Natura 2000 sites in Brussels, Belgium, reduce noise by 1.5 dB, contributing to local residents’ physical and mental well-being [9]; German Natura 2000 sites provide accessible natural spaces for urban residents [10].

(3) Economic benefits. Natura 2000 promotes industrial development and transformation, creating opportunities and providing funding support for ecological agriculture, sustainable forestry, sustainable fisheries, ecotourism, and climate-adaptive green infrastructure development [11]. A 2011 assessment by the Institute for European Environmental Policy (IEEP) showed that Natura 2000 generates approximately €189–360 billion in economic value for the EU annually (including use and existence values) [11]. As market recognition of ecosystem service values such as forest carbon sinks increases, the economic value embodied by Natura 2000 continues to rise [12].

(4) Social development benefits. Natura 2000 has created numerous jobs and improved community governance effectiveness. For example, Hoge Kempen in Belgium, a former coal mining area facing economic recession risks, has provided over 400 jobs and achieved annual direct economic benefits of €20 million through the establishment of a national park with support from Natura 2000 special funds [8]. Natura 2000 is committed to building “green spaces” in protected area communities to strengthen residents’ sense of community identity [13–15] and has established stakeholder participation mechanisms that incorporate multiple actors into protected area management decision-making, improving community governance [16].

2 EU Natura 2000 Protected Area Construction and Management

Building and managing the world' s largest regional protected area network faces numerous challenges. Natura 2000' s success is attributed to adequate support from policy, administrative, and funding resources, as well as efficient and multi-party coordinated organizational operations. Five mechanisms—compliance supervision, decision-making and implementation, strategic planning, funding support, and technological innovation—provide key support for the expansion and governance effectiveness improvement of Natura 2000 (Figure 1 [Figure 1: see original paper]). Over its 30 years of preparation and operation, Natura 2000 has continuously summarized management experience and optimized management measures, forming a management system with legal basis, overall coordination, scientific decision-making, effective incentives, and proper supervision.

2.1 Compliance Supervision: Consensus-Based Regional Legislation as the Foundation

The compliance supervision mechanism provides a legitimacy foundation for Natura 2000, constraining all member states and participating actors within a behavior framework centered on conservation principles, and laying a solid foundation for subsequent administrative and policy resource allocation.

2.1.1 Taking Biodiversity Conventions as the Legal Basis EU countries concluded the Convention on the Conservation of European Wildlife and Natural Habitats (also known as the Berne Convention) in 1979, and issued the Birds Directive in the same year. In 1992, they became the first signatories to the Convention on Biological Diversity and issued the Habitats Directive. The Nature Directives, comprising both the Birds Directive and the Habitats Directive, form the legal basis for nature and biodiversity conservation in all member states. Through regional legislation, the EU responds to international biodiversity conservation conventions, standardizes and strengthens the EU' s legal framework and institutions for biodiversity protection, and promotes policy and action coordination.

2.1.2 Initiating Legislative Processes from the EU to Form Laws and Regulations Recognized and Jointly Followed by Member States

Natura 2000 was established and operates according to relevant EU acts. Relevant acts are proposed by the European Commission, discussed by the European Council, and revised and approved by the Council of the EU together with the European Parliament. After approval by 55% of member states in the Council (representing at least 65% of the EU population) and a majority vote in the European Parliament, they become legally binding regulations for all EU member states or implementation chapters for European Commission policies (Figure 2 [Figure 2: see original paper]).

2.1.3 Promoting Member State Compliance Through Regional Legislation The Nature Directives are the main basis for judicial decisions related to Natura 2000. Meanwhile, the European Commission has formulated several related regulations such as the EU Invasive Alien Species Regulation as supplements, which together with the Nature Directives form the legal foundation of Natura 2000 (Table 2). EU member states and the EEA carry out Natura 2000 construction and management work under this legal framework, effectively improving their capacity and effectiveness in fulfilling international biodiversity conservation commitments.

The European Commission can sue seriously non-compliant member states in the European Court of Justice. If a member state is found to be non-compliant after review, it must make improvements without delay. The European Court of Justice can order member states to comply with judgments and implement conventions, and may also impose economic penalties. According to Article 191 of the Treaty on European Union, violations of laws and regulations related to Natura 2000 are classified as particularly serious offenses.

2.2 Decision-Making and Implementation: Emphasizing Multi-Stakeholder Participation

The EU resolution process and the whole-process participation of multiple stakeholders in decision-making and implementation provide a representative foundation and reasonable decision-making support for effectively coordinating multi-party active participation in Natura 2000 construction.

2.2.1 Coordinating Multi-Party Opinions and Implementing Top-Down Natura 2000's decision-making and implementation mechanism follows the existing EU process from top to bottom (Figure 3 [Figure 3: see original paper]), with emphasis on coordinating opinions of all member states. Heads of EU member states discuss the development direction and strategy of nature and biodiversity conservation at the European Council, using Natura 2000 as an important strategic implementation platform. The European Commission, through its European Environment Agency (EEA), coordinates Natura 2000-related policy formulation and organizes and coordinates decision-making arrangements among member states. Each member state authorizes different management agencies for Natura 2000 management, supervision, and direct operation according to its national conditions.

2.2.2 Establishing a Whole-Process Participation Process for Stakeholders Natura 2000 has conducted extensive beneficial explorations of stakeholder participation in protected area management processes. The EEA points out in its management guidelines that stakeholder participation helps promote sustainable development and public interest realization [8,9,16], including promoting information sharing to make decision-making processes more open, fair, and credible; improving relevant parties' awareness and responsibility for eco-

logical conservation; and providing broader perspectives and more information for decision-making, thereby improving decision quality and sustainability. To this end, the EEA has issued guidance documents multiple times, calling on Natura 2000 site managers to attach importance to stakeholder participation in developing management plans, establishing management agencies, jointly implementing conservation, knowledge sharing, and education and training, thereby promoting whole-process stakeholder participation [17,18].

2.3 Strategic Planning: Large-Area Vision and Cyclical Planning

The strategic planning mechanism fully considers holistic biodiversity conservation needs and develops management plans that conform to biodiversity conservation mechanisms, providing a scientific foundation for Natura 2000.

2.3.1 Conducting Strategic Planning Based on Comprehensive Monitoring Data The EU uses Natura 2000 protected sites as a foundation to support European ecological conservation strategic decision-making through large-scale data collection. The EEA and related nature conservation research institutions collaborate to conduct surveys and publish the *State of Nature in the EU* report every six years. This report evaluates the status of nature and biodiversity conservation in Europe under the Nature Directives framework, providing detailed data and scientific support for EU strategic planning.

2.3.2 Coordinating Comprehensive Biodiversity Conservation Planning Across the Region Natura 2000 construction follows principles of European-wide, holistic, and connectivity. The European Commission leads member states in conducting European biodiversity conservation strategic planning at European Council regular meetings and special sessions [18]. The EEA assesses EU territory as a whole, and based on respecting each member state's own biodiversity conservation laws and regulations, coordinates the entire region to propose conservation strategies that each country needs to implement. This approach helps increase the internal connectivity of Natura 2000 and improve overall conservation quality [6], and can avoid some unnecessary conservation measures to reduce protection costs. For example, following EEA recommendations, Austria reduced the conservation level of plateau moss species that are not endangered from a European perspective.

2.4 Funding Support: Standardized Funding Application and Review

The funding support mechanism provides a feasibility foundation for Natura 2000, mobilizing the enthusiasm of member states to carry out biodiversity conservation work, guiding work directions and conducting performance assessments through effective methods to improve governance effectiveness.

2.4.1 Diversified Funding Support Mechanism In 2015, the European Council's most recent assessment showed that all Natura 2000 sites require ap-

proximately €5.8 billion in annual operating funds, mainly from member state finances and EU biodiversity conservation funds. Between 2014–2020, the EU’s comprehensive annual budget allocated approximately €550–1,130 million to Natura 2000 [19]. The European Commission, seizing the opportunity of COP15, issued a joint statement calling on multilateral development banks to incorporate biodiversity conservation into their actions and expand nature financing to achieve the UN’s 2030 Sustainable Development Goals.

Meanwhile, Natura 2000 also receives support from EU policies on agriculture, forestry, fisheries, and regional development funds. After years of exploration, the EU has combined financial instruments such as the LIFE program to provide seven fundable project options for Natura 2000 sites in its management guidelines (Table 3). These seven funds all originate from the European Commission budget and are disbursed to eligible applicants (generally individuals, groups, or enterprises) through a project “application-approval” mechanism. Among them, the LIFE program fund provides main funding support for Natura 2000 and fully covers 25 specific tasks in the Natura 2000 implementation guidelines. The other six funds are large-scale EU funds supporting development and construction in various fields, which can provide funding for Natura 2000 in projects related to protected areas in relevant fields [13,20]. Each fund has its own focus in supporting Natura 2000 to achieve its own goals (Table 4). For example, the European Agricultural Fund for Rural Development (EAFRD) requires that more than 35% of its funded projects be used for farmland transformation and rural sustainable development; the European Social Fund (ESF) requires that 75% of funds be used for projects in regions with per capita GDP below 75% of the EU median. Thus, Natura 2000 has established a multi-fund mechanism with special funds as the mainstay and other comprehensive funds as support, linking Natura 2000 construction and management with other EU sustainable development goals and promoting synergy.

2.4.2 Using the Funding “Application-Approval” Mechanism to Achieve Performance Evaluation and Supervision

The European Commission uses a funding “application-approval” mechanism to achieve performance evaluation and supervision of Natura 2000 site management. In 2014, the European Commission provided a guiding policy tool called the “Prioritized Action Framework” (PAF) for Natura 2000, aiming to assist member states in clarifying their biodiversity conservation priorities within a 12-year cycle. The feasibility of the plan and its match with the national PAF are key to whether the site can successfully apply for relevant funding. Funds are applied for every six years and evaluated every three years. This has brought Natura 2000 sites into a planned management stage, filling the gap where nearly half of Natura 2000 sites lacked long-term, cyclical management plans before 2014 [17].

2.5 Technological Innovation: Long-Term Monitoring and Data Sharing Empowering Scientific Management

Based on Natura 2000 monitoring data and management practices, research and management institutions in the EU and globally continue to carry out research and innovation, providing a scientific foundation for the sustainable development of Natura 2000.

2.5.1 Scientific and Standardized Site Selection and Data Recording

Natura 2000 site applications must complete standard data forms developed by the EEA. Information corresponding to each Natura 2000 site is recorded and reviewed during the application, proposal, and establishment processes. The EEA also feeds back the assessment results of site data forms (mainly reporting threats and pressures to site biodiversity) to site managers as an important reference basis for developing local conservation management plans and for conservation effectiveness assessment [21].

2.5.2 Data Disclosure After standardized data collection, Natura 2000 data is published on its official website and compiled into annual summary reports. Data disclosure positively influences the feasibility and reliability assessment of conservation policy implementation and conservation effectiveness monitoring, and helps summarize excellent management models and methods [22]. By compiling panel data to assess the impact of EU biodiversity development plans, it empowers macro decision-making [23]. By promoting standardized data collection methods and making them public, it further expands the application scope of Natura 2000 data [24].

2.5.3 Scientific Research Cooperation Facilitating Management Model Innovation

Natura 2000 conducts extensive scientific research cooperation with EU research institutions and other global research institutions and universities. Through more than 20 years of continuous monitoring and research follow-up, it has achieved efficient information integration and diversified utilization, providing more powerful support for scientific management decision-making of protected areas and providing detailed data support and research samples for disciplines such as ecology and geography [8,11-13,19,20,22].

3 Implications

3.1 Implications for China to Promote Global Biodiversity Governance

The “30×30 target” proposed in the Kunming-Montreal Framework is an ambitious yet arduous task. Currently, biodiversity conservation status varies worldwide and is generally not meeting expectations. Factors such as global geopolitical games, economic downturns, and the COVID-19 pandemic have led to funding shortages, posing risks of further weakening biodiversity governance

implementation [25]. As the COP15 presidency, China played a leading role in facilitating the adoption of the Kunming-Montreal Framework and urgently needs to explore a practical and feasible implementation pathway to promote the framework's execution and play a leading and exemplary role in global biodiversity governance [26].

Natura 2000 has successful experience in promoting multi-country biodiversity conservation cooperation and managing large-area protected area networks, which has important reference significance for China to promote global biodiversity governance. China can draw on the five major mechanisms of Natura 2000's successful operation to promote the construction of global and regional transnational protected area networks in areas important for global biodiversity conservation, vulnerable areas urgently needing enhanced protection, and regions with certain political and economic cooperation foundations, providing practical and feasible implementation pathways for achieving the “30×30 target.”

- **Drawing on the EU's experience** of promoting Natura 2000 construction through existing regional cooperation mechanisms, and relying on the Belt and Road Initiative, China-ASEAN Comprehensive Strategic Partnership, Shanghai Cooperation Organization, Greater Mekong Sub-region Economic Cooperation, and other intergovernmental cooperation mechanisms initiated and participated in by China, China can initiate and lead the establishment of a batch of regional transnational protected area networks, playing a leading and exemplary role in global regional protected area network construction.
- **Calling on regional international organizations** with good cooperation mechanisms, such as the Association of Southeast Asian Nations, African Union, and Union of South American Nations, to promote regional transnational protected area network construction.
- **Initiating several international scientific programs** on global biodiversity and important habitat surveys and assessments led by China to clarify the baseline conditions of areas important and vulnerable for biodiversity conservation, and gradually establish international standard systems for biodiversity and important habitat surveys, assessments, and data to provide scientific data support for global regional protected area network construction.
- **Launching integrated planning** for holistic protected area networks to increase protected area connectivity and layout rationality.
- **Advocating that regional international organizations** with legislative bodies promote regional biodiversity conservation legislation based on the Convention on Biological Diversity to lay a compliance foundation for regional protected area network construction.
- **Exploring diversified funding mechanisms** that fully utilize the Global Biodiversity Fund, global and regional international organizations, international NGOs, and member states' relevant funds to support regional protected area network construction.

3.2 Implications for China to Strengthen the Construction of a Protected Area System with National Parks as the Mainstay

National parks are of national importance. China is promoting the construction of a protected area system with national parks as the mainstay and the world's largest national park system. Despite initial achievements, building and managing such a vast protected area system still faces a series of problems, including funding shortages, prominent conflicts between conservation and development, insufficient multi-party participation, and unreasonable spatial layout [27,28]. Natura 2000's resource support and organizational operation systems provide good experience for solving problems in large-scale protected area network governance and have important reference significance for China to further strengthen the construction of a protected area system with national parks as the mainstay.

(1) Promoting a national-led, multi-party participatory decision-making and implementation mechanism. Currently, China's protected area construction and management adopts a traditional path of national leadership, local implementation, and encirclement protection, without yet forming a feasible multi-party participation mechanism, and the channels and boundaries for participation by various social sectors are not clearly defined [26]. China can learn from Natura 2000's decision-making and implementation mechanism to strengthen the construction of a whole-process multi-party participation system for protected area management in China, achieving co-construction, co-governance, and sharing of the protected area system with national parks as the mainstay.

- Clarify the participation methods and scope of all social sectors in national park and protected area legislation, standardize enterprise concession and social organization collaborative governance models.
- Establish and improve institutional systems for multi-party participation such as scientific decision-making and consultation, agreement-based conservation, public welfare donations, concessions, and volunteer systems, giving full play to the initiative and important roles of research institutions, social organizations, enterprises, the public, and communities in the construction and management of the protected area system with national parks as the mainstay, promoting co-construction, co-governance, and sharing.

(2) Promoting a macro-coordinated, holistic strategic planning mechanism. China's protected area system with national parks as the mainstay has overlapping designations and protection gaps, and lacks good coordination with ecological red lines and territorial spatial planning due to different planning entities [29]. China can learn from Natura 2000's holistic planning strategy to optimize China's protected area system planning by coordinating national territorial spatial planning and control standards.

- Macroscopically coordinate and optimize the planning layout of China's protected areas. On the basis of the *National Park Spatial Layout Plan*,

promote the overall spatial layout planning of the protected area system with national parks as the mainstay, fill important protection gaps, and improve protected area connectivity.

- Deepen the “multi-plan integration” reform to promote the mutual connection and consistency of the protected area system with national parks as the mainstay, ecological red lines, and territorial spatial planning in spatial terms, and ensure close coordination in control requirements to form a synergy.

(3) Promoting diversified investment and whole-process coverage funding support mechanisms. By 2035, China plans to basically complete the construction of the world’ s largest national park system in terms of total area. Under the current economic slowdown, strengthening the promotion of building a protected area system with national parks as the mainstay faces potential funding pressure. China can learn from Natura 2000’ s experience and introduce a multi-sector funding support mechanism into China’ s protected area work to achieve better funding integration.

- Establish a comprehensive funding mechanism based on the special funds for natural protected areas from the forestry and grassland system, supplemented by national major projects from various departments such as national biodiversity surveys, ecosystem protection and restoration, and rural revitalization, to ensure comprehensive funds cover all major businesses of various protected areas.
- Further optimize protected area concession and agreement-based protection systems to attract social capital, public welfare organizations, and other investments in the construction of the protected area system with national parks as the mainstay, ensuring that capital investment conforms to the functional positioning of protected areas.

(4) Standardizing data collection and management and building platform integration to empower technological innovation mechanisms. China’ s protected area system with national parks as the mainstay currently suffers from scattered data, information silos, and single-use methods, and has not yet formed a powerful big data synergy effect [30]. China can learn from Natura 2000’ s experience in site data monitoring and public data platform construction to integrate numerous data and information sources within China’ s protected area system and build a big data platform for China’ s protected areas.

- Take the lead in establishing basic data collection standards and norms for national park construction and management, gradually improve monitoring and statistical systems, establish a basic information database for China’ s national park system to serve scientific research and management decision-making for national parks, and gradually extend it to other types of protected areas [31].
- Build a big data platform for China’ s protected areas, establish data sharing mechanisms, share data through thematic datasets, common

databases, and visual displays, promote scientific research, and support management decision-making.

- Cooperate with future protected area construction and management performance indicator systems, collect relevant data to reflect conservation progress, and improve the scientific management level of protected areas.

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Notes:

The United Kingdom participated in Natura 2000 construction as an EU member state until its official “Brexit” on February 1, 2020.

The Institute for European Environmental Policy (IEEP) calculates the economic benefits of Natura 2000 as a credible range based on multiple evaluation scales. The report emphasizes that only a small portion of economic benefits are reflected in cash transactions, with even less direct revenue flowing into protected areas. The extremely high economic and social value of protected areas is usually not directly visible.

Note: Figure translations are in progress. See original paper for figures.

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